

ML7660-EVK-001/ML7661-EVK-001

User's manual

Issue Date 01 26, 2024

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Introduction

ML7660-EVK-001/ML7661-EVK-001 is a reference design for healable devices.
This user's manual describes ML7660-EVK-001/ML7661-EVK-001.

Notation

Classification	Notation	Description
• Numeric value	0xnn 0bnnnn	Represents a hexadecimal number. Represents a binary number.
• Address	0xnnnn_nnnn	Represents a hexadecimal number. (indicates 0xnnnnnnnn)
• Unit	word, W byte, B Mega, M Kilo, K (uppercase) Kilo, k (lowercase) Milli, m Micro, μ Nano, n Second, s (lowercase)	1 word = 32 bits 1 byte = 8 bits 10^6 $2^{10}=1024$ $10^3=1000$ 10^{-3} 10^{-6} 10^{-9} Second
• Terminology	“H” level “L” level	Signal level on the high voltage side; indicates the voltage level of V_{IH} and V_{OH} as defined in electrical characteristics. Signal level on the low voltage side; indicates the voltage level of V_{IL} and V_{OL} as defined in electrical characteristics.
• Register description	Read/write attribute: R indicates read-enabled; W indicates write-enabled. MSB: Most significant bit in an 8-bit register (memory) LSB: Least significant bit in an 8-bit register (memory)	

Table of Contents

Notes	1
Introduction	2
Notation	3
Table of Contents	4
1. Overview	5
1.1 Overview	5
1.2 Functions	5
1.3 Example Configuration	5
2. ML7660-EVK-001	6
2.1 Board Information	6
2.2 Schematic	6
2.3 Parts list	7
2.4 Layout (Top View)	7
3. ML7661-EVK-001	8
3.1 Board Information	8
3.2 Schematics	8
3.3 Parts list	9
3.4 Layout (Top View)	10
4. Reference evaluation data	10
4.1 Charging Profiles	10
4.2 Substrate temperature	11
Revision Histories	12

1. Overview

1.1 Overview

ML7661-EVK-001 is equipped with a power transmitter LSI ML7661 and ML7660-EVK-001 is equipped with a power receiver LSI ML7660. By facing the antennas, ML7660-EVK-001 can output 300mW of power.

- ML7660-EVK-001 can wirelessly charge batteries in a small space.
- EVK-001 is equipped with a detection function to detect the presence or absence of the battery.

1.2 Functions

- ML7661/ML7660 proprietary control
- FOD, removal detection
- Charging control using external charging IC
Poller uses external power supply 5V
Listener Li-ion battery 14mAh (4C charging)
- 300mW power supply (1mm distance between antennas)
- Detection of detachment
- Host interface
Universal communication based on I2C interface

1.3 Example Configuration

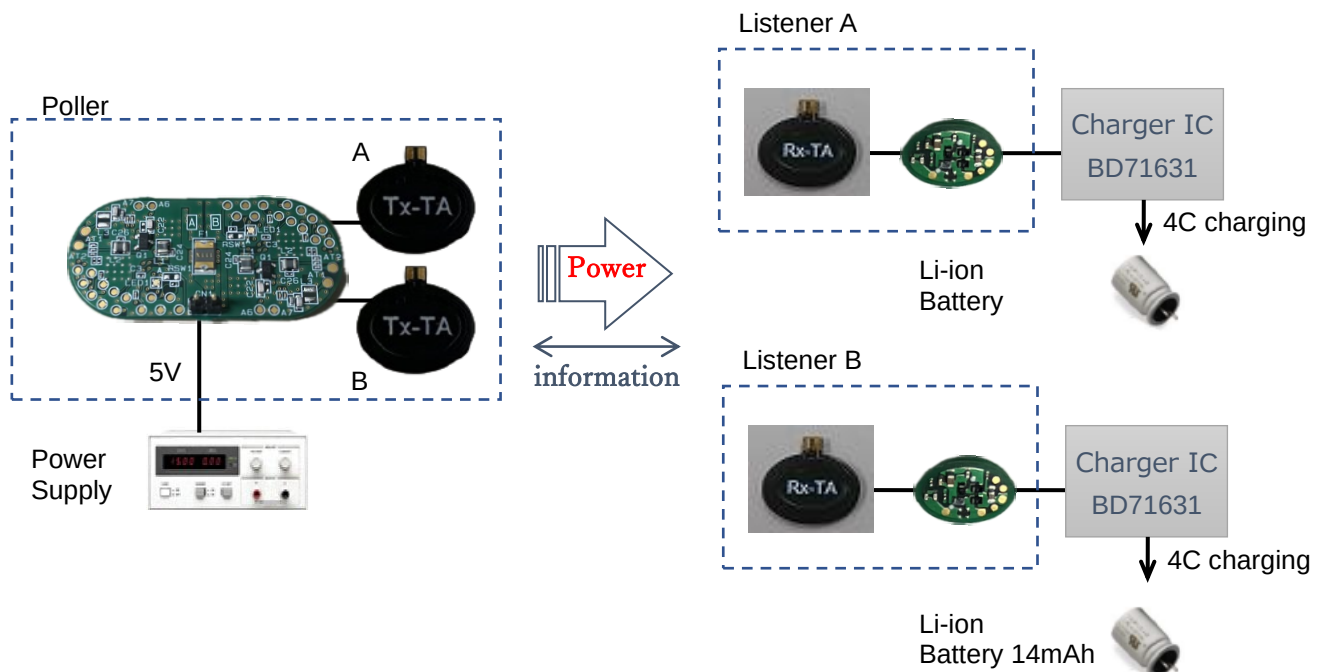


Figure 1 Example of reference configuration

2. ML7660-EVK-001

2.1 Board Information

- Size: 8.2mm x 5.8mm x 0.5mm
- Number of layers: 4
- Material: FR-4
- Copper thickness: 5um (Outside), 18um (Inside))

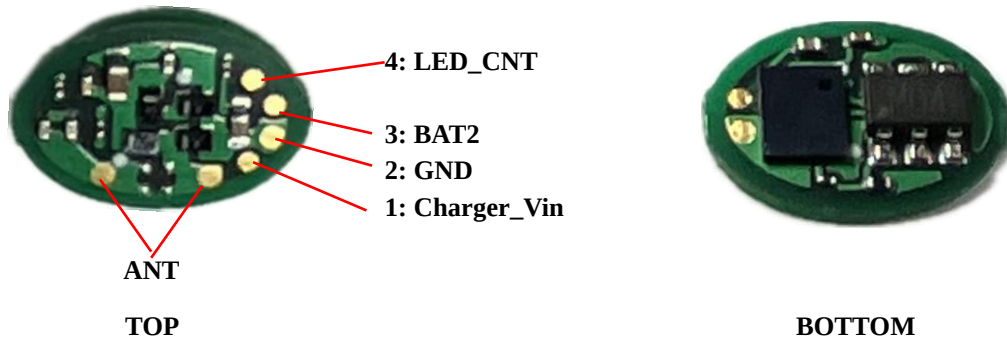


Figure 2 ML7660-EVK-001

2.2 Schematic

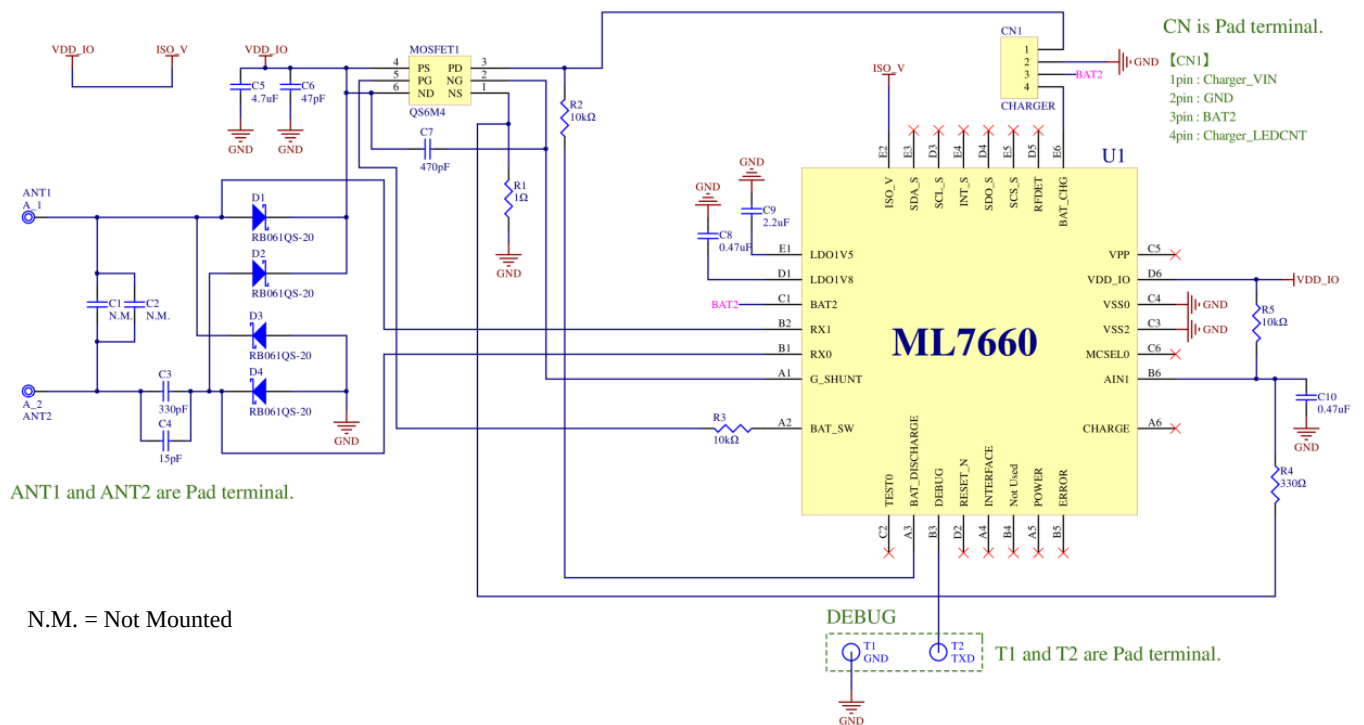


Figure 3 ML7660-EVK-001 Schematic

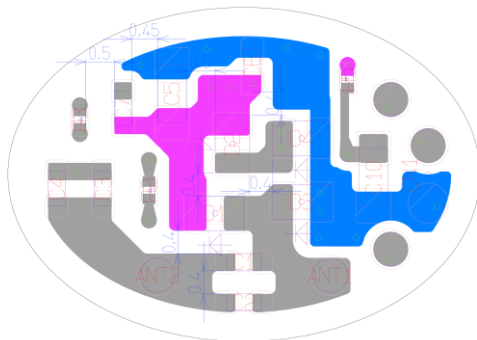
2.3 Parts list

Table 1 ML7660-EVK-001 Parts list

Part	Type	Value	Part Number	Manufacture	Package size	Qty
C1, C2	Capacitor, Surface Mount	N.M.	-	-	0603	2
C3	Capacitor, Surface Mount	330pF	GRM0335C1H331GE01#	Murata	0603	1
C4	Capacitor, Surface Mount	15pF	GRM0335C1H150GA01#	Murata	0603	1
C5	Capacitor, Surface Mount	4.7uF	GRM155R61A475ME01#	Murata	1005	1
C6	Capacitor, Surface Mount	47pF	GRM0335C1H470FA01#	Murata	0603	1
C7	Capacitor, Surface Mount	470pF	GRM033R11C471KA01#	Murata	0603	1
C8	Capacitor, Surface Mount	0.47uF	GRM033R60J474KE90#	Murata	0603	1
C9	Capacitor, Surface Mount	2.2uF	GRM035R61C225ME01#	Murata	0603	1
C10	Capacitor, Surface Mount	0.47uF	GMD155R61A474KE11#	Murata	1005	1
D1, D2, D3, D4	Schottky_Diode	-	RB061QS-20	Rohm	SOD-882	4
MOSFET1	Nch + Pch MOSFET	-	QS6M4TR	Rohm	SOT-457T	1
R1	Resistor, Surface Mount	1Ω	-	Rohm	0603	1
R2, R3, R5	Resistor, Surface Mount	10kΩ	-	Rohm	0402	3
R4	Resistor, Surface Mount	330Ω	-	Rohm	0402	1
U1		-	ML7660-311HBZ03E	LAPIS Technology	WLCSP30(2.28mm×2.61mm)	1

2.4 Layout (Top View)

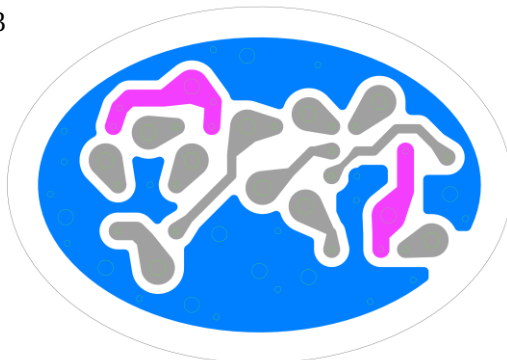
L1



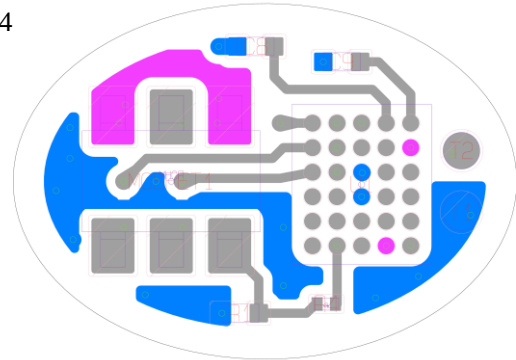
L2



L3



L4



3. ML7661-EVK-001

3.1 Board Information

- Size: 45mm x 21mm x 0.5mm
- Number of layers: 4
- Material: FR-4
- Copper thickness: 18 μm (outside), 35 μm (inside)

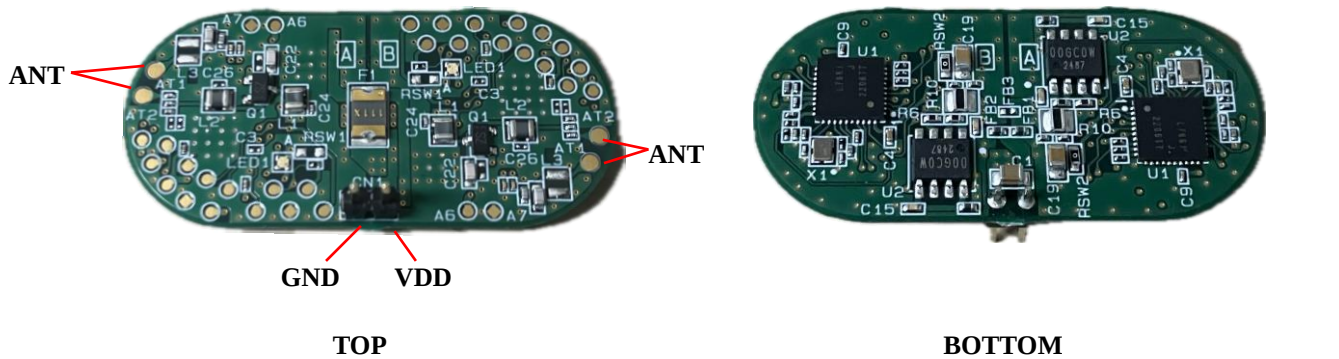


Figure 4 ML7661-EVK-001

3.2 Schematics

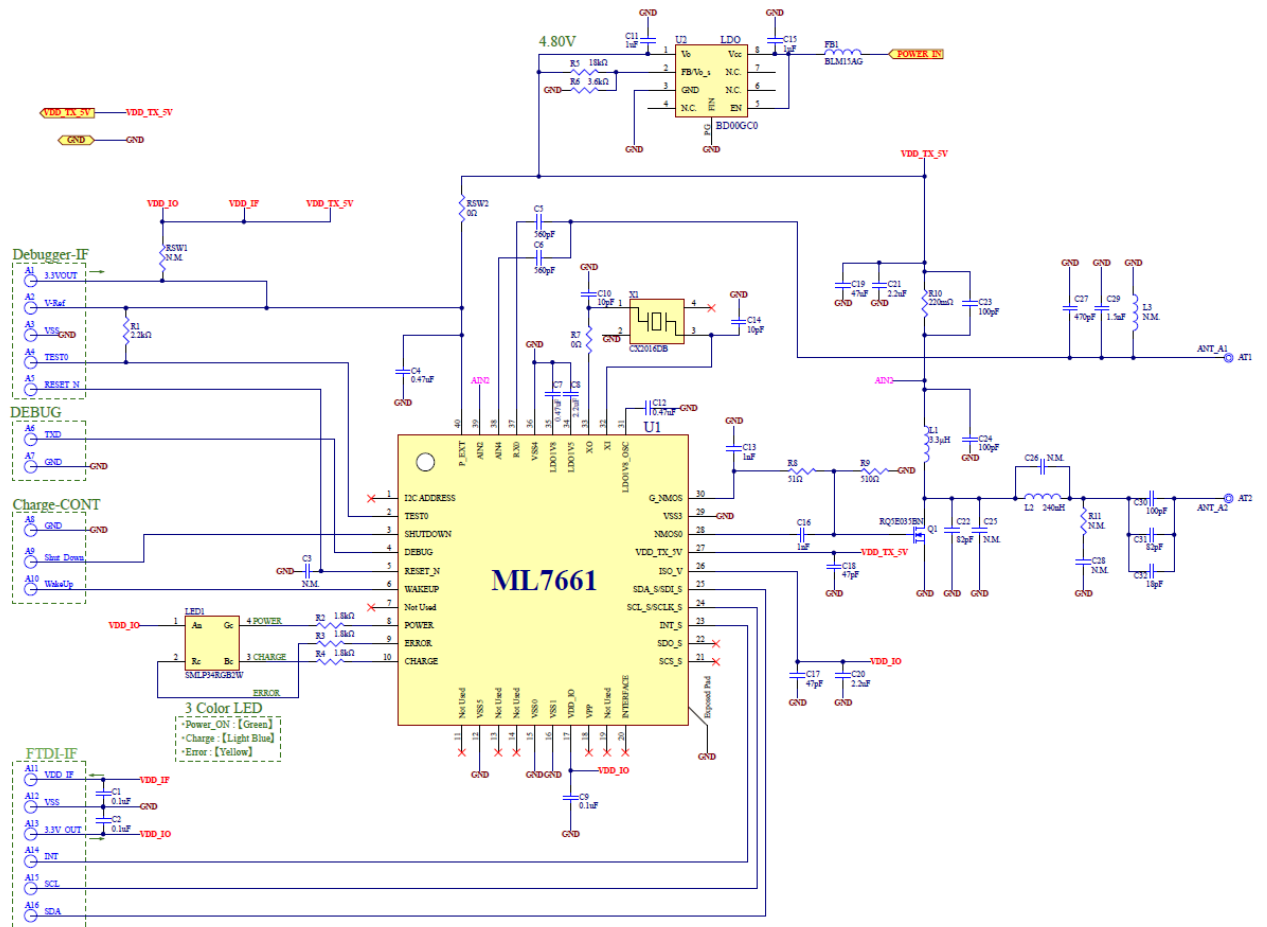


Figure 5 ML7661-EVK-001 main Schematic

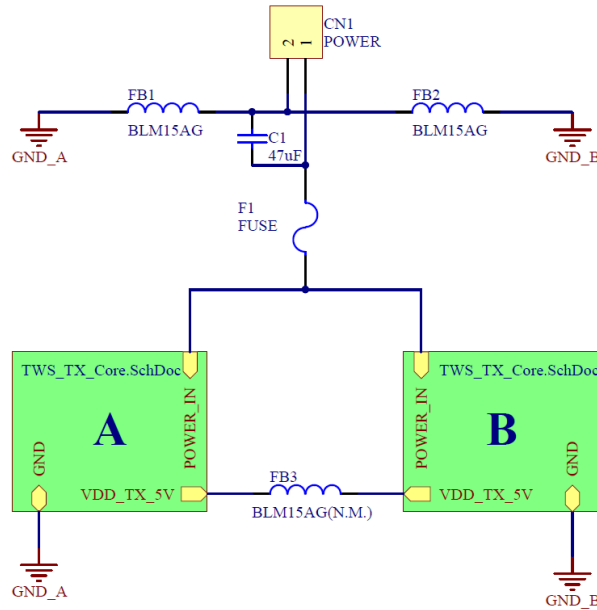


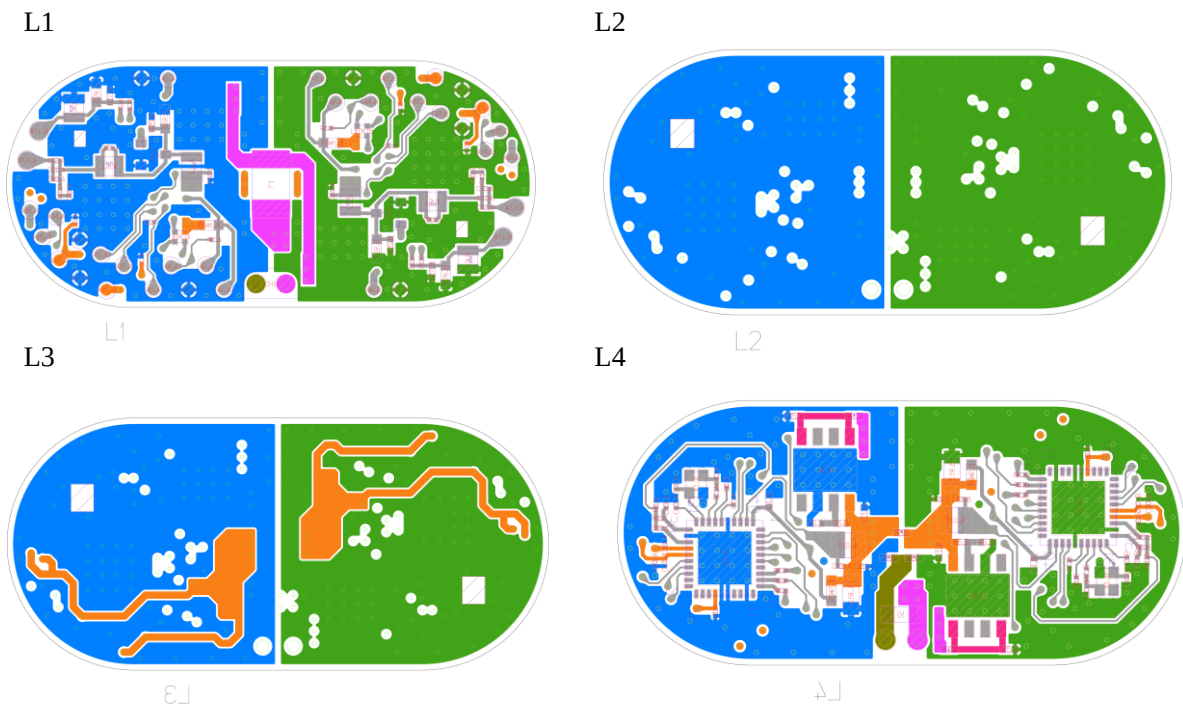
Figure 6 ML7661-EVK-001 Power supply Block

3.3 Parts list

Table 2 ML7661-EVK-001 Parts list

Part	Type	Value	Part Number	Manufacture	Package size	Qty
C1	Capacitor, Surface Mount	47uF	GRM21BR61A476ME15#	Murata	2012	1
C1_A, C1_B, C2_A, C2_B, C9_A, C9_B	Capacitor, Surface Mount	0.1uF	GRM033R61C104KE18#	Murata	0603	6
C3_A, C3_B, C26_A, C26_B, C28_A, C28_B	Capacitor, Surface Mount	N.M.	-	-	0603	6
C4_A, C4_B	Capacitor, Surface Mount	0.47uF	GMD155R61A474KE11#	Murata	1005	2
C5_A, C5_B, C6_A, C6_B	Capacitor, Surface Mount	560pF	GRM033R11C561KA01#	Murata	0603	4
C7_A, C7_B, C12_A, C12_B	Capacitor, Surface Mount	0.47uF	GRM033R60J474KE90#	Murata	0603	4
C8_A, C8_B, C20_A, C20_B, C21_A, C21_B	Capacitor, Surface Mount	2.2uF	GRM035R61C225ME01#	Murata	0603	6
C10_A, C10_B, C14_A, C14_B	Capacitor, Surface Mount	10pF	GRM0335C1H100GA01#	Murata	0603	4
C11_A, C11_B, C15_A, C15_B	Capacitor, Surface Mount	1uF	GRM153B31A105ME95#	Murata	1005	4
C13_A, C13_B	Capacitor, Surface Mount	1nF	GRM033B11E102KA01#	Murata	0603	2
C16_A, C16_B	Capacitor, Surface Mount	1nF	GRM0335C1E102FA01#	Murata	0603	2
C17_A, C17_B, C18_A, C18_B	Capacitor, Surface Mount	47pF	GRM0335C1E470JA01#	Murata	0603	4
C19_A, C19_B	Capacitor, Surface Mount	47uF	GRM21BR61A476ME15#	Murata	2012	2
C22_A, C22_B	Capacitor, Surface Mount	82pF	GQM1875C2E820FB12#	Murata	1608	2
C23_A, C23_B, C24_A, C24_B	Capacitor, Surface Mount	100pF	GRM0335C1H101FA01#	Murata	0603	4
C25_A, C25_B	Capacitor, Surface Mount	N.M.	-	-	1005	2
C27_A, C27_B	Capacitor, Surface Mount	470pF	GRM1555C1H471GA01#	Murata	1005	2
C29_A, C29_B	Capacitor, Surface Mount	1.5nF	GRM1882C1H152JA01#	Murata	1608	2
C30_A, C30_B	Capacitor, Surface Mount	100pF	GRM0335C2A101GA01#	Murata	0603	2
C31_A, C31_B	Capacitor, Surface Mount	82pF	GRM0335C1H820GA01#	Murata	0603	2
C32_A, C32_B	Capacitor, Surface Mount	18pF	GRM0335C1H180GA01#	Murata	0603	2
CN1	2pin Pin header	-	-	-	2.54mm pitch, φ=1.02mm	1
F1	FUSE	-	MF-MSMF110/16-2	Bourns	4.55mm×3.24mm	1
FB1, FB1_A, FB1_B, FB2	-	-	BLM15AG100SN1D	Murata	1005	4
FB3	-	-	-	-	1005	1
L1_A, L1_B	Inductor, Surface Mount	3.3μH	LQM2MPN3R3NG0L	Murata	2mm×1.6mm	2
L2_A, L2_B	Inductor, Surface Mount	240nH	LQM2MPNR24MEHL	Murata	2mm×1.6mm	2
L3_A, L3_B	Inductor, Surface Mount	N.M.	-	-	2mm×1.6mm	2
LED1_A, LED1_B	3-color LED	-	SMLP34RGB2W	Rohm	1mm×1mm	2
Q1_A, Q1_B	-	-	RQ5E035BN	Rohm	SOT-346T	2
R1_A, R1_B	Resistor, Surface Mount	2.2kΩ	-	Rohm	0603	2
R2_A, R2_B, R3_A, R3_B, R4_A, R4_B	Resistor, Surface Mount	1.8kΩ	-	Rohm	0603	6
R5_A, R5_B	Resistor, Surface Mount	18kΩ	-	Rohm	1005	2
R6_A, R6_B	Resistor, Surface Mount	3.6kΩ	-	Rohm	1005	2
R7_A, R7_B	Resistor, Surface Mount	0Ω	-	-	0603	2
R8_A, R8_B	Resistor, Surface Mount	51Ω	-	Rohm	0603	2
R9_A, R9_B	Resistor, Surface Mount	510Ω	-	Rohm	0603	2
R10_A, R10_B	Resistor, Surface Mount	220mΩ	-	Rohm	1.2mm×2.0mm	2
R11_A, R11_B	Resistor, Surface Mount	N.M.	-	-	0603	2
RSW1_A, RSW1_B	Resistor, Surface Mount	N.M.	-	Rohm	1608	2
RSW2_A, RSW2_B	Resistor, Surface Mount	0Ω	-	Rohm	1608	2
U1_A, U1_B	-	-	ML7661-311GDZ05BX	LAPIS Technology	P-WQFN40-0606-0.50-63	2
U2_A, U2_B	LDO	-	BD00GC0	Rohm	HTSOP-J8	2
X1_A, X1_B	-	-	CX2016DB27120D0	Kyocera	2.0mm×1.6mm	2

3.4 Layout (Top View)



4. Reference evaluation data

4.1 Charging Profiles

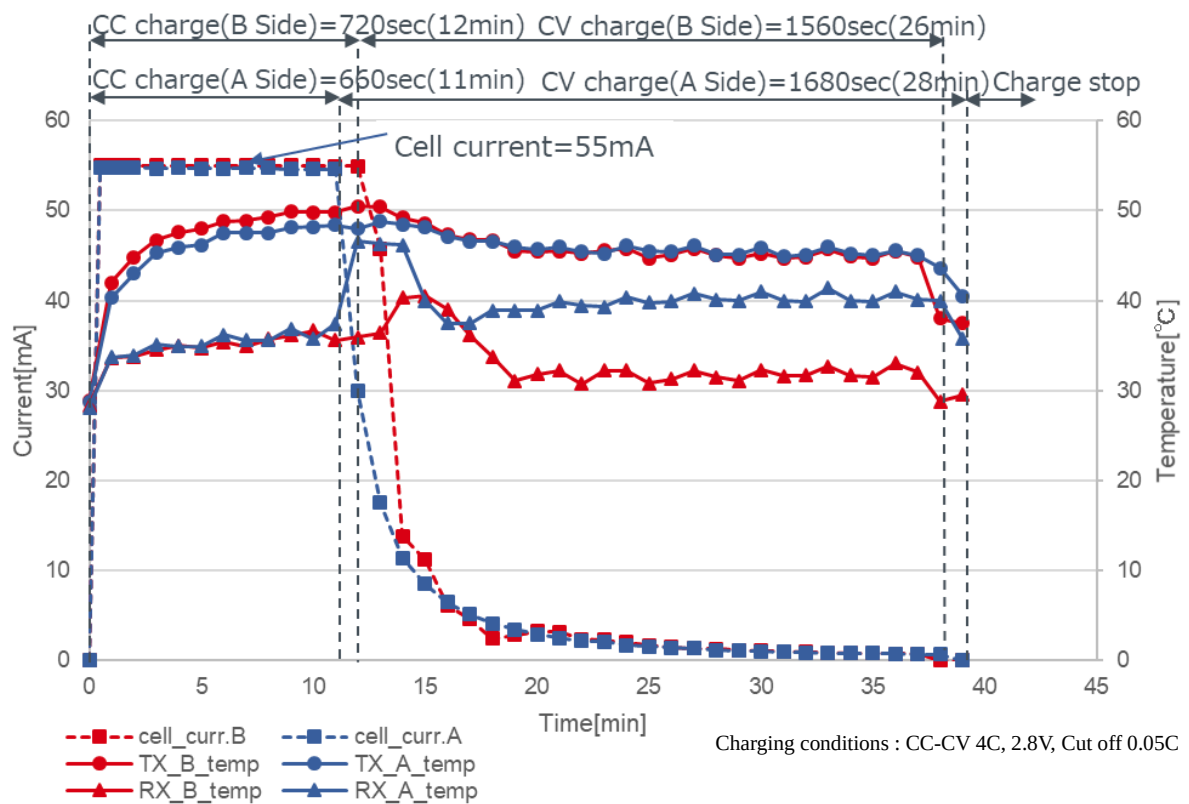


Figure 7 Charging profiles

4.2 Substrate temperature

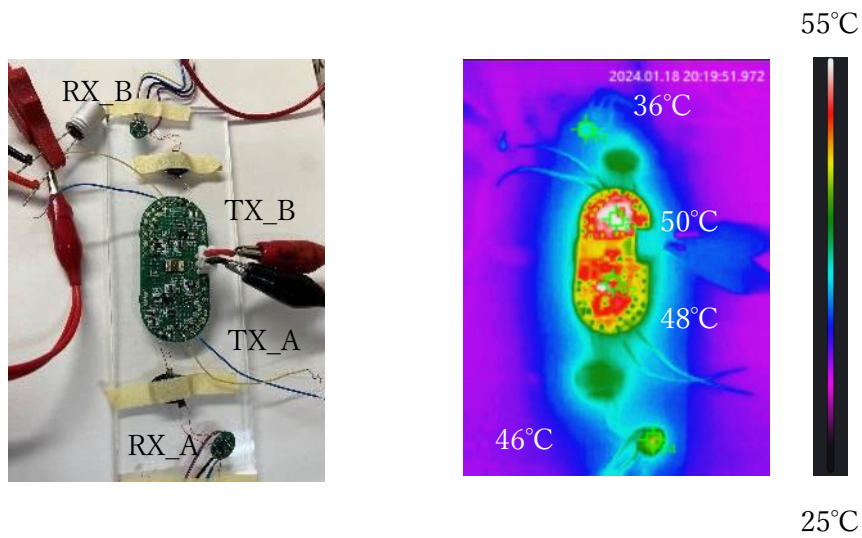


Figure 8 Substrate temperature

Note: The data shown is for reference only. They are not guaranteed values.
Temperatures may vary depending on the actual operating environment.

Revision Histories

Document No.	Date of issue	Page		Description of change
		Before	After	
FEXT766x-EVK-001_UM-01	2024.01.26	—	—	First edition